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Abstract

Hides, skins as well as live animals are among the main commodities that are used to earn foreign currency in Ethiopia. Ectoparasitic skin diseases of domestic ruminants caused by lice, sheep kades, ticks and mange mites are among the major diseases that result serious economic loss to smallholder farmers, tanning industries and to the country at large. In 1996/97, six tanneries in and around Addis Ababa had rejected 2,037,745 pieces of skins which caused a loss of USD 6.3 million and in 1998/99 three tanneries that are found in Amhara Regional State have reported 443,602 pieces of skin rejection per annum which worth USD 1.4 million loss. Ectoparasitic skin diseases due to ticks, lice, sheep kades and mange mites cause 35% of sheep skin and 56% of goat skin rejections. These parasites can be controlled using commercial drugs (pesticides), but their accessibility and affordability to the poor Ethiopian farmers, and lack of safety of the commercial organophosphorous compounds towards human and environment makes them unattractive for use. Thus, this review paper tries to present the over all country status on ectoparasites in animals in Ethiopia.

Keywords: Ethiopia, ectoparasites, hide and skin, rejection.

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Introduction

The total numbers of sheep and goats in Ethiopia are estimated about 25.5 and 23.4 millions respectively (CSA, 2003). They are found adapted to different climates in all production systems. They also have lower feed requirements compared to cattle because of their small body size. Ethiopia offers a wide range of processed and semi-processed sheep and goatskins to the world market. Some of the skin and the skin products such as the high land sheepskin wing to its quality and natural characteristics have gained international reputations. Based on the off take rates of 33% for sheep and 32.5% for goats the annual production of skin is estimated at 16.6 million pieces. The total earnings of the country from 1998 to 2004 ranged between \$405 and \$590 millions with annual average of \$450 million for both hides and skins (Tadesse, 2005; Ayele *et al.*, 2003).

Therefore, small ruminants are important components of the Ethiopian farming system. However, contribution of sheep and goats to food production, rural and export income are far below the expected potential. This is because small ruminant production in Ethiopia is constrained by the compound effects of diseases, poor feeding and poor management (Kassa, 2005; Ayele *et al.*, 2003). Losses from these skin diseases are due to downgrading and rejections of skins, unthriftiness, loss of body condition, mortality and decreased in production. This is reflected in tanning industries of the world in general and in Ethiopia in particular. Kassa and his colleagues in 1998 showed that skin diseases due to external parasites causes 35% of sheep skins and 56% of goat skin rejections in some Ethiopian tanneries. Studies and reports from different parts of the country showed that skin quality deterioration is very evident mainly due ectoparasites (Tefera, 2004; Numery, 2001; Ermias, 2000; Asegedech *et al.*, 1999; Kassa, 2005). Lice, keds, mange mites and ticks are the major ectoparasites of small ruminants in Ethiopia.

Status of Small Ruminant Ectoparasites in Ethiopia

Sheep and goats contribute about 12% of the value of livestock products consumed at the farm

level, 48% of the cash income generated but only 6.6% of the capital invested in this livestock sector by farmers. They provide 46% of the value of national meat production and 58% of the value of hide and skin production thus they play an integral part of the production (Tembely, 1998). External parasites are the major causes of skin diseases that hamper small ruminant production in many areas of Ethiopia. Studies conducted in different parts of the country in the last 20 years have revealed the prevalent nature of ectoparasitism. The studies have indicated that the occurrence and spread of skin diseases have been shown to correlate with host factors, poor management, climatic factors, feed scarcity and inadequate veterinary services (Kedir, 2002; Molu 2002; Teshome, 2002). Some of the studies on skin diseases of small ruminants conducted in Ethiopia are summarized in table 1.

Mange Mites

Mange mites are common in Ethiopia and therefore are reported from many geographic areas. The prevalence of major mange mites from these areas are indicated in table 1. Based on the reports mange mites are most prevalent in three national regional states of Ethiopia namely, the Tigray, Amhara and Oromia regional states (Etagegnehu, 1992; FAO, 1995; Kassa *et al.*, 1998; Asegedech *et al.*, 1999; Tefera, 2004; Haffize, 2001).

The most important mange mites known to cause skin diseases are Sarcoptes, Psoroptes, and Demodex (Haffize, 2001). These ectoparasites cause tremendous loss of skin through downgrading and rejections (Ermias, 2000; Chalachew, 2001; Numery, 2001; Molu, 2002; Teshome, 2002).

Sarcoptic Mange

Sarcoptic scabiei var caprae and Sarcoptic scabiei var ovis have a wide geographic distribution in many goat and sheep raising arid and semi-arid areas of Ethiopia and it is more commonly seen in goats than sheep. The highest prevalence of sarcoptic mites observed in sheep and goats were 30.32% in Tigray and 43.10% in Dire Dawa respectively.

Psoroptic Mange (Sheep Scab)

psoroptic mange, caused by Psoroptes ovis, which is common in Ethiopia, is reported from

different study areas. Mites of the genus psoroptes cause psoroptic mange in sheep and goats. In sheep its prevalence is found greater than in goats therefore, it causes greater damage in sheep than in goats. Etagegnehu (1992) and Nigatu (1992) have reported that Psoroptes has a prevalence of 42.9% and 32.87% from Cheffe State farm (Wollo) and Addis Ababa respectively.

Demodectic Mange

Demodectic mange has been reported in sheep (*Demodex ovis*) and goats (*Demodex caprae*). Studies in Ethiopia (table 1) have indicated that it is one of the major skin diseases of sheep and goats (Etagegnehu, 1992; Chalachew, 2001; Molu, 2002). Naturally, demodex is most important in goats than sheep (Gray, 1995). However, based on reports by Habte (1994) in and around Mekelle demodectic mange has the higher prevalence of 4.73% in sheep.

Pediculosis

Lice infestation in Ethiopia is the most frequently reported and the most important skin disease of small ruminants this is because lice are found to be the cause of cockle. Tefera and Abebe (2007b) in their research indicated that *Bovicola ovis* and *Linognathus* species in sheep has a prevalence of 38.5% and 2.4% respectively. In goats *Linognathus* species has prevalence of 28.3%. Other reports (Molu, 2002; Teshome, 2002; Numery, 2001; Haffize, 2001) showed the significance of lice in Ethiopia.

Sheep Ked (Melophagus Ovinus) Infestations

Melophagus ovinus is more prevalent in highlands than midlands and no cases yet recorded in lowlands in the country. The prevalence of “Ekek”, an Amharic word for itch, lesion in *Bovicola ovis* and *Melophagus ovinus* infested groups of sheepskin were 100% and 95%, respectively. Infestation of sheep with *Bovicola ovis* and *Melophagus ovinus* leads to the development of “Ekek” and causes higher proportion of skins to fall into the lower grades (Tefera and Abebe, 2007a). Ermias (2000) unveiled that from the freshly examined sheep pelts 32.7% had *Melophagus ovinus* in Sebeta Tannery.

Tick Infestations

A lot of studies on tick distribution, prevalence, species identification, effect on domestic animals and methods of prevention were done as compared to other important skin diseases of animals in Ethiopia (table 1). These studies cover most of the areas of Ethiopia, which are known in their cattle population. Both hard ticks (*Ixodidae*) and soft ticks (*Argasidae*) are known to affect small ruminants. *Amblyomma* species (*A. varigatum*, *A. cohaerense*, *A. gemma*, *A. lipidium*, *A. excavatum* and *A. hebricum*) are known tick species identified. *A. varigatum*, *A. cohaerense* and *A. gemma* are the most prevalent species of the genus *Amblyomma* in order of importance respectively (Abuna *et al.*, 2009; Tedla, 1991). *B. decoloratus* is also encountered in small ruminants (Mehari, 2004). *Rhipicephalus* species (Daniel 1994; Zelalem, 1994; Yitbarek 2004), *Hyalomma* species (Surafael, 1996; Wallaga, 1997) and *Haemaphysalis* species (Bekele 2002; Daniel 1994) were identified. Alekaw (2000) also showed that these tick genera are frequently encountered in Ethiopia. Etagegnehu (1992) indicated that tick has highest prevalence (57.4%) in Cheffe state farm, South Wollo and in the same year Zelalem has found that it has a prevalence of 41.77% in Dire Dawa.

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Table 1: Status of ectoparasites in sheep and goats in different study sites of Ethiopia.

Author	Study Sites	Total Animals Examined		Prevalence (%)		Ectoparasites
		Sheep	Goats	Sheep	Goats	
Etagegnehu, 1992	Cheffe State farm (Wollo)	63	-	42.9	-	Psoroptic mange
				3.2		Demodectic mange
				57.4		Ticks
Chalachew, 2001	In and around Wolayta Soddo	-	212	-	0.47	Sarcoptic mange
				1.8	2.25	Psoroptic mange
				0.83	1.37	Demodectic mange
Haffize, 2001	Central Ethiopia	3003	2040	2.0	1.52	Pediculosis
				0.93	1.71	Ticks
					33.27	Sarcoptic mange
					1.36	Demodectic mange
					11.54	Pediculosis
Numery, 2001	Kombolcha (South Wollo)	-	589		4.58	Ticks
				0.22	0.20	Sarcoptic mange
				0.15	0.37	Psoroptic mange
				0.88	3.50	Demodectic mange
				-	0.31	Pediculosis
Molu, 2002	Southern Range Lands, Oromia	1363	4098	9.54	5.25	Ticks
				30.32	31.77	Sarcoptic mange
				22.7	43.10	Sarcoptic mange
Kidir, 2000 Zelalem, 1994	Tigray Dire Dawa	310 723	384 1306	41.77	0.007	Ticks
				0	0.44	Sarcoptic mange
				1.63	0.95	Psoroptic mange
Teshome, 2002	Sidama Zone	845	675	23.5	18.3	Pediculosis
				10.1	15.9	Ticks
				32.87	-	Psoroptic mange
Nigatu, 1992	Addis Ababa	369	-	11.93	-	Sarcoptic mange
				1.15		Psoroptic mange
				4.73		Demodectic mange

Note: All the reports from different regions of Ethiopia indicate that ectoparasites are found rampant in diverse in this country. The study includes: Addis Ababa, Amhara, Tigray, South nations and nationalities and Oromia regions and Dire Dawa administration council.

Effects of Ectoparasitic Skin Diseases on the Quality of Raw, Semi-Processed and Processed Skin

In Ethiopia large numbers of sheep and goats are slaughtered per annum. The numbers of skins that reach the tanneries for processing is however smaller than expected (Asfaw, 2002; Numery, 2001; Ermias, 2000; Zewdu, 1995). The Ethiopian tanning industry has long complained about the grades of small ruminant skins, which resulted in poor quality of processed skins. This, therefore, creates a serious problem for competition in international markets through the export of processed skin. Almost all commercial tanneries have indicated rejections of 20-24% of purchased skins from sheep and goat, which has resulted in a loss of \$6.9 million (Belachew, 2003 and 2004).

Skin problems caused by lice, keds, mange and ticks are among the major pre-slaughter defects that reduce skin qualities and results in rejections (Tefera and Abebe, 2007a; Asfaw, 2002). The predominant causes of downgrading and rejection of skin from sheep and goat were said to be "Ekek", an Amharic word (term) meaning itch. In the tanning industry, "Ekek", anonymous with cockle, is the main cause of downgrading of skins in the early processing stage (Heath *et al.*, 1995a; 1995b). Tick bites leave small but distinct blemish on the skin, which appears as a small hole in the leather. Such skins give "ticked" leather, which is of inferior quality (Henderson, 1991). Lice infestations particularly that of *Bovicola ovis* greatly damages the grain of skin. (Heath *et al.*, 1995a; 1995b; Mullen and O'Connor, 2002).

Tannery grading on infected skin have determined that sheep and goats harboring ectoparasites (especially of lice, keds, and some times sarcoptic mange) have "Ekek" lesions in their processed skins (Tefera and Abebe, 2007a; Ermias, 2000). Therefore, in order to improve the overall supply and quality of skins, skin diseases in general and ectoparasites in particular affecting small ruminants need to be controlled. Control of ectoparasites using acaricides has been proven efficacious, however, at tanneries treated "Ekek" free skins from sheep and goats have been down graded (Heath *et al.*, 1995a; Stosic, 1996). The

lesion "Ekek" wouldn't heal quickly. It would take about three months to heal after treatment (Kassa *et al.*, 1998).

Discussion

Prevalence

The problem of ectoparasites in small ruminants in Ethiopia remains very imperative as they are extensively distributed in all agro-ecological zones affecting all age groups. Based on this review, different studies have indicated that the prevalence nature of ectoparasites in Ethiopia. Tefera and Abebe (2007b) reported that ectoparasites of different species have 50.5% and 56.4% prevalence in sheep and goats respectively. Similarly reports from the Amhara National Regional State (Kassa *et al.*, 1998; Asegedech *et al.*, 1999; Ermias 2000; Numery 2001) noted that ectoparasites are the bottleneck in the production of good quality skins from sheep and goats due to their wide geographic prevalence in the country and their consequences.

Ectoparasites

Major ectoparasites identified in Ethiopia and have paramount economic importance were *Damalina ovis* (now called *Bovicola ovis*), *Linognathus* species, *Melophagus ovinus*, *Sarcoptes* mites, *Psoroptes* mites, demodex, different tick species, fleas and flies (Etagegnehu, 1992; Chalachew, 2001; Haffize, 2001; Numery, 2001; Molu, 2002; Kidir, 2000; Zelalem, 1994; Teshome, 2002; Nigatu, 1992; Habte, 1994).

Economic Significance

Ectoparasites play an important role in the life of sheep and goats; not only because of the damage they cause to the sheep directly, but also because of the important diseases they transmit when they live and feed on animals (Radostits *et al.*, 1994). A considerable portion of the pre-slaughter defects that accounts for 65% are directly related to skin diseases caused by the ectoparasites; or to the secondary damage that occurs when the animal scratches itself to relief the itching. Wounds and skin irritation inflicted by these parasites result in discomfort. These have paramount economic losses due to skin downgrading and rejections incurred by

the tanneries. In the previous studies skins infested with sarcoptic mange, *Bovicola ovis* and *Melophagus ovinus* were observed to have “Ekek” an Amharic word for itch. Asegedeche *et al.*, (1999) and Tefera and Abebe (2007a) studied that “Ekek” was resulted in connection with the *Bovicola ovis* and *Melophagus ovinus* in sheep and *Linognathus* species and sarcoptic mange. Heath *et al.*, (1996) added that there is a direct correlation between louse (*Bovicola ovis*) scores and cockle, high louse scores being associated with a more severe degree of cockle. Legg *et al.*, (1991) and Heath *et al.*, (1996) indicated that economic losses from the effects of feeding and scratching due to sheep ked on the skin with hard nodules (cockle) reducing the value of the skin. Louse infestation may indicate some underlying problem such as malnutrition and chronic diseases. The irritation caused by even a modest population of lice leads to scratching and rubbing, causing damage to the skin and severe infestation with *Linognathus* species may cause anemia (Wall and Shearer, 1997).

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